

Neutral-current induced pion and photon productions off nucleons

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My proposed project, in collaboration with Dr. Mikhail Gorshteyn at University of Mainz, is to study the neutral-current induced pion meson and photon productions in (GeV) neutrino-nucleon scattering. We will apply the so-called dispersion analysis, which is a model-independent method tested in the related nucleon Compton scattering study. The photon production was considered as a candidate for the low energy excess event seen at MiniBooNE neutrino oscillation experiment. This claim is questioned by my calculation as well as those of others. The proposed study is intended to eliminate the model dependence in my previous calculations. To achieve this goal, the dispersion analysis on the pion production is also required. Moreover, the pion analysis will be useful in extracting the poorly known nucleon to Delta resonance (axial current) transition information from possible future neutrino-nucleon scattering measurements.

Recently we have investigated a special limit of the photon production process, in which the photon moves along the neutrino beam direction. We found an interesting relationship between the multiplication of nucleon axial current coupling and its magnetic moment, and a specific structure function (g_5). This structure function could be related to the parton distribution functions in nucleon. Considering the dispersion analysis hasn't been carried out before, we look forward to more interesting nuclear physics coming out in this study.